

Public Safety Broadband Interoperability

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Introduction

- “3.5 billion subscribers can’t be wrong”
 - 3GPP standards are inherently designed for wide interoperability and roaming
 - GSM and W-CDMA prime examples
 - Primary reason 3GPP standards came to dominate
- All the “hooks” for roaming and interoperability
 - *Will achieve interoperability if you want it to*
- As an innovative company, IPWireless looks to solve technical challenges

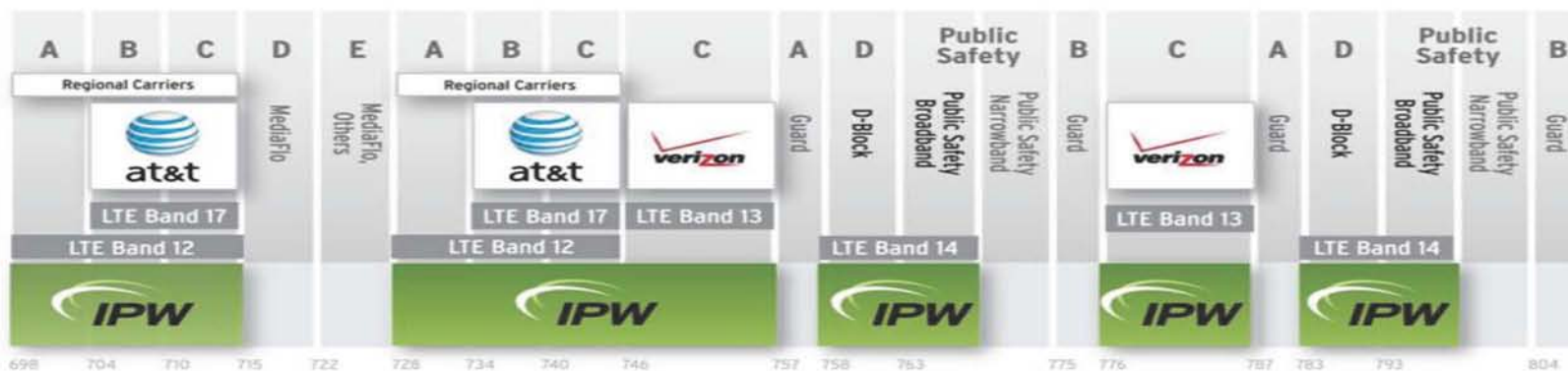
Potential Issues

- Band Class
 - UE band 14 support
 - Other 700 MHz band class support for roaming and preemption
 - Roaming to commercial bands / other 3GPP releases
- UE Power class
- IOT testing / UE certification
- Standardized VOIP support – PTT / group
- Deployment issues
- Support of roaming interfaces
- Roaming and interoperability policy / governance
- Clearing house arrangements
- PLMN numbering
- VPN and application access control

.....All solvable if there is a will

Band Class Issues

- There are >24 3GPP band classes for LTE, plus 3G bands to support. 4 band classes in 700 MHz alone
- UE filter / FEM volume manufacturers only building filters for major commercial bands (e.g. band 13)
 - However, other filtering solutions (lower volume) are available
- Interference issues:
 - TV channel 51 interference is not a UE interference issue
 - Greater UE blocking / coexistence issue from D & E (FLO, Echostar)



Band Class Issues

- Filtering challenges
 - narrow duplex gap between band 13 and band 14
 - Duplexor achievable with current technology
- Multiple filters for UE covering all 700 MHz band classes
 - Size / cost issue rather than technical
- Half Duplex FDD (H-FDD) would make covering all 700 MHz band classes easier
 - Additional benefit in lower insertion loss, lower noise rise
 - Included in LTE standards, but F-FDD mandatory in UE, even when both F-FDD and H-FDD are both supported
 - Consider new UE category for Public Safety?

UE Power Class

- Frequent questions on increasing UE power to extend coverage
 - Standard power class is 23 dBm
- Increase to 27 – 30 dBm, or even higher ?
 - Would require new 3GPP power class
 - Battery issues less in larger PS devices than commercial UE
 - Potential issue with inbound roamers with standard UE's into a network designed for higher power
 - Translates to reduced coverage probability
 - May be acceptable in some cases
 - Analogous to hand-portable vs. mobile in PS voice networks

IOT testing / UE certification

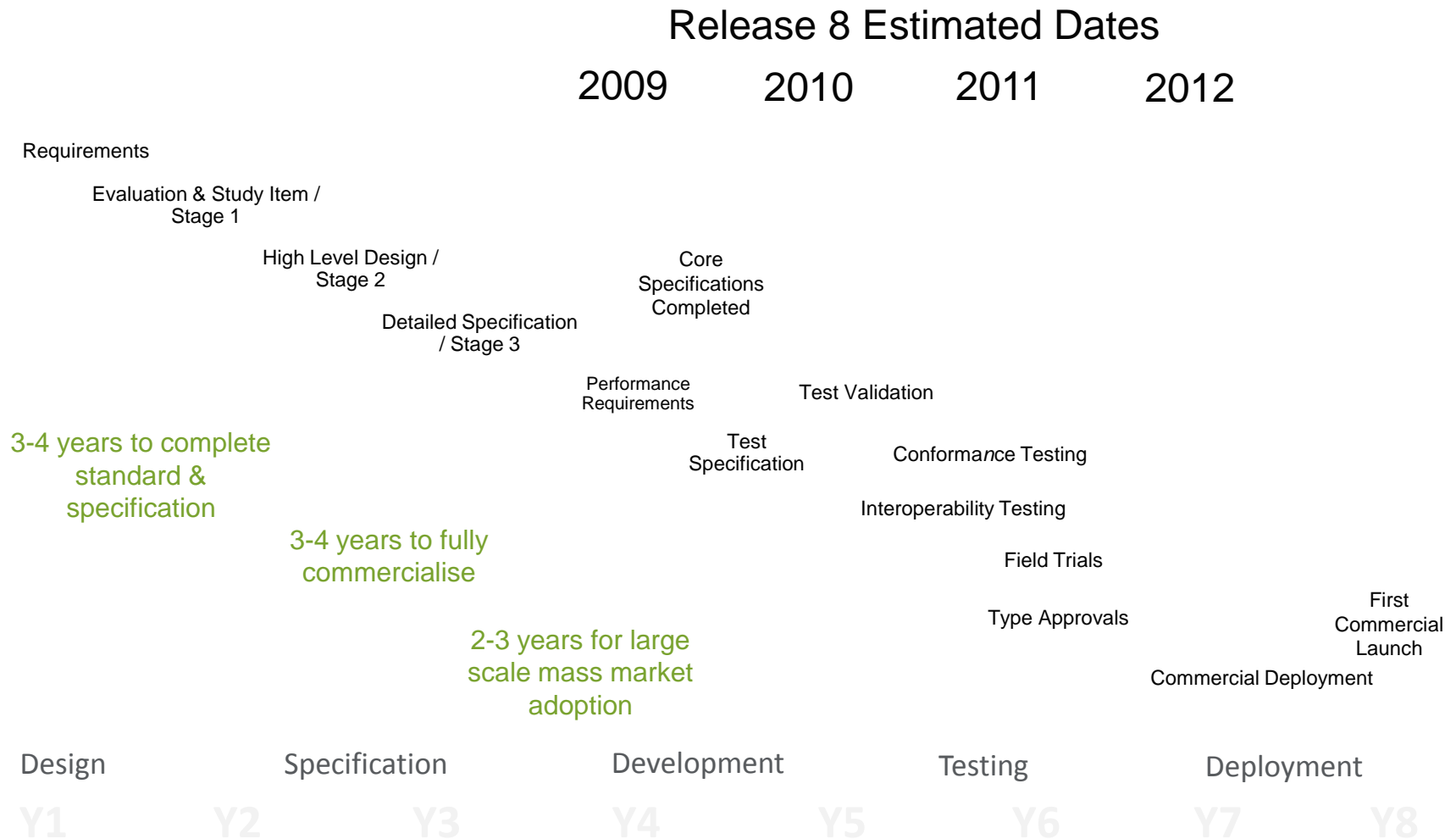
- Process
 - 3GPP prepares test suites (end 2010)
 - Implemented by test system manufacturers (2011)
 - Testing of UEs (2011 – 2012)
 - Certification by GCF (international) and PTCRB (US) - 2012 +
 - Commercial operators often do own IOT in addition
- Prior to certification
 - “Private” IOT between UE and Infrastructure vendors
 - Logistical limit to how many combinations can be tested
 - Does not guarantee interoperability
- Any new features for public safety will require additional tests

Deployment Challenges

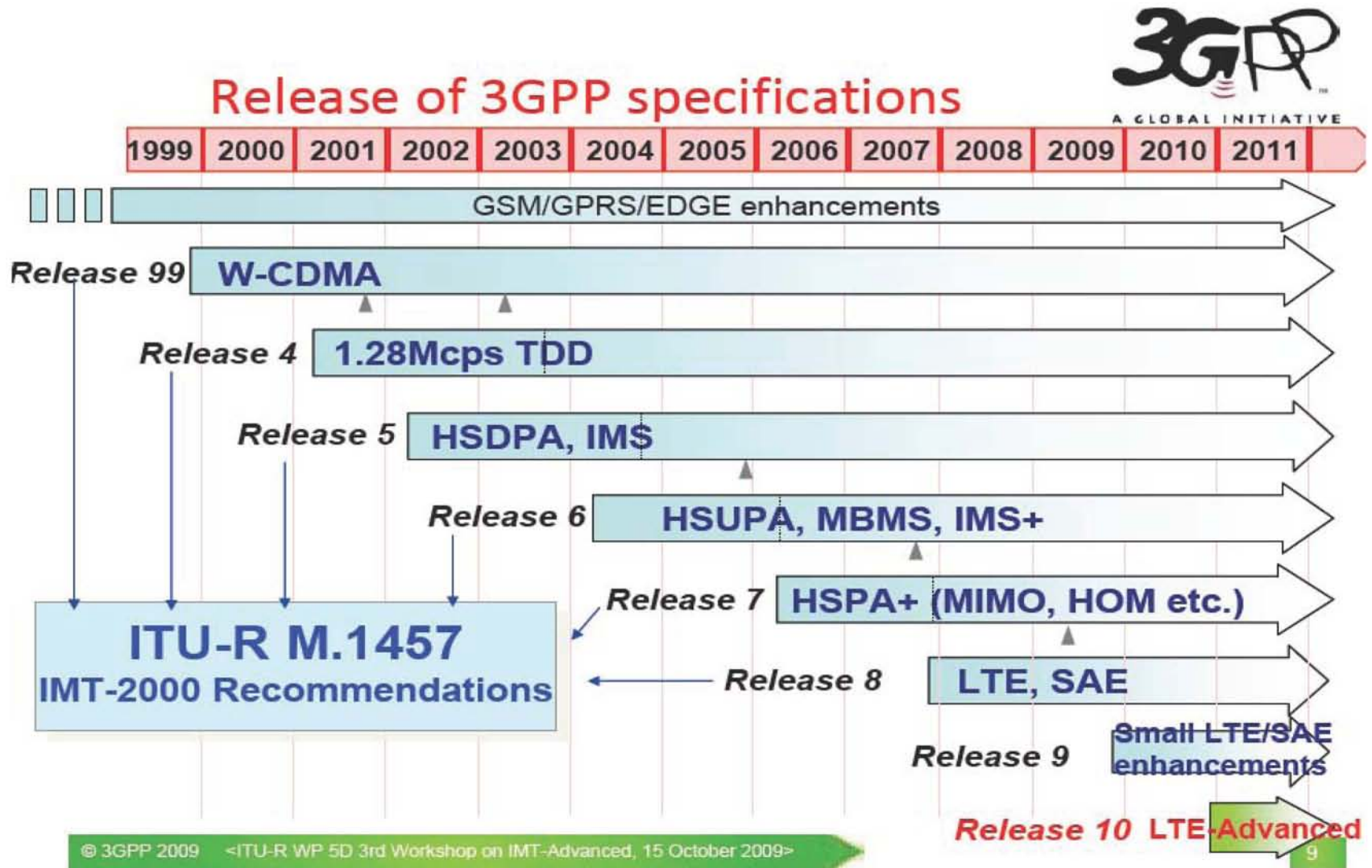
- Maximizing rural coverage
 - Demand for higher power UE
 - Use of high sites increase intercell interference
 - Incentive for advanced intercell interference mitigation (IIM)
 - Could result in UEs with differing performance
- Urban indoor coverage
 - Variable is site density
 - Distributed antenna systems for major buildings, campus
 - RF planning for high probability indoor coverage results in high intercell interference outdoors
 - Commercial operators deal with this by using dual frequency network.
 - Need for IIM

Backup

3GPP Timeframe for a New Standard - With Reference to LTE



History of 3GPP Standards



Timeframe for LTE Advanced (Rel 10 and beyond)

